lambda scientific

CATALOGUE

V-1

sales@lambdasci.com
www.lambdasci.com

COMPANY PROFILE

Lambda Scientific specializes in developing and manufacturing various spectrophotometers, spectroscopic instruments, thin film measurement, microplate reader, physics education equipment, opto-mechanical parts, and laboratory light sources. Spectrophotometer products include FTIR, ultraviolet-visible spectrophotometers. Our spectroscopic instruments include laser Raman spectrometer, multifunctional grating spectrographs and monochromators. They are either manual or computer-controlled. Physics experimental instruments and education kits cover a wide range of experimental projects in general physics, especially in geometrical, physical, modern and fiber optics. We also provide a variety of opto-mechanical parts and optical breadboards. Laboratory light sources include xenon lamps, mercury lamps, sodium lamps, bromine tungsten lamps and various lasers. Our products have been sold around the world.

Lambda Scientific is committed to providing high quality, cost effective products and on-time delivery.

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Spectrophotometers

LIVI-300 Visible Spectrophotometer

LIVI-300 Visible Spectrophotometer is a single beam, general purpose instrument designed to meet the needs of the laboratories for analysis. It is ideal for various application fields such as chemistry, medicine, environmental protection, food and beverage, wine industry and quality control.

Specifications

Optical System	Single beam, grating,1200l/mm
Wavelength Range	325-1000 nm
Wavelength Accuracy	±2 nm
Wavelength Repeatability	1 nm
Photometric Range	0-125%T, 0-2.0A, 0-1999C(0-1999F)
Photometric Accuracy	±1.0%T
Photometric Repeatability	≤ 0.5%T
Stray Light	≤ 0.5%T at 340 nm and 400 nm
Bandwidth	5nm
Data Output	RS-232
Power	220~240VAC/50Hz or 110VAC/60Hz
Standard Holder Installed	Test Tube Holder (8 to 25 mm dia.)
Dimensions	408 x 308 x 180 mm
Weight	6.5 kg

Features

- Digital display of photometric result
- Dynamic range of 325-1000nm
- Flexible sample compartment
- Auto zero function
- Easy operation

Modes

- Transmittance
- Absorbance
- Concentration
- Factor

LIUV-201 UV-Vis Spectrophotometer

LIUV-201 is a stand-alone model with 2nm fixed bandwidth. It provides excellent performance for measurements in the range of 190nm to 1100nm. It has a large angled LCD screen with contrast adjustment for comfort viewing. The large sample compartment accommodates a wide range of cell holders and accessories including sipper and a peltier system. Optional Windows post-run application software make this instrument very versatile.

Features

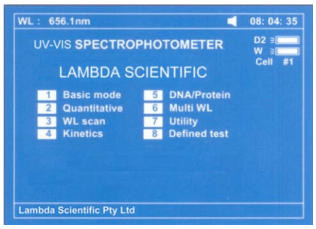
- Automatic wavelength scanning
- Accommodates a wide range of cell holders
- Non–volatile memory and one-button recall
- Pre-aligned lamps for easy replacement
- Full A4 print-outs of graphs and tables of results
- Real-time clock for date and time stamping
- Performance validation and report
- Full CE and C-tick compliance

Specifications

Monochromator	Single beam, grating system 1200 lines/mm
Wavelength Range	190-1100nm
Wavelength Accuracy	±0.5nm
Wavelength Repeatability	0.3nm
Wavelength Resolution	0.1nm
Photometric Range	0-200%T, -0.3-3.0A, 0-9999Conc.
Photometric Accuracy	±0.5%T
Photometric Repeatability	±0.3%T
Stray Light	≤0.05%T@220nm&340nm
Bandwidth	2nm
Stability	< 0.002A/h@500nm
Baseline Straight	±0.004A
Scanning Speed	Hi, Med., Low, Max. 1000nm/min
Display	Graphic LCD(320×240) dots
Keyboard	29 Membrane keyboard
Data Output	RS-232
Light Source	Tungsten Halogen/Deuterium Lamp
Detector	Solid Silicon Photodiode
Scanning Speed	Hi, Med., Low. Max. 1000 nm/min

Modes

1. Basic Mode
2. Quantitative
3. WL scan
4. Kinetics
5. DNA/Protein
6. Multi Wavelength
7. Utility - GLP
8. Defined Test



LIUV-210/310 UV-Vis Spectrophotometer

LIUV-210/310 is a single-beam/dual-beam UV/Vis spectrophotometer with 1.8nm fixed or variable bandwidth. This instrument can be operated by a PC via a USB cable. It can also be operated through the front panel display for basic functions. Fast scan speeds, accuracy and high resolution are its features. It is an indispensable analysis tool for various application fields such as chemistry, medicine, food and beverage, wine industry, chemical engineering and quality control.

Features

- Single/dual beam and automatic wavelength scanning
- Measurement of specified wavelength T, A, C
- Scanning interval: 0.1, 0.5, 1, 2, 5 nm
- Dynamic feedback ratio recording photometric system, with baseline stability
- Quick scanning up to 800 nm/min, 3 scan speeds
- Recording baseline of full wavelength range
- LCD screen, soft touch buttons, easy operation.
- USB interfaced and easy software upgrading
- Powerful software with quantitative analysis.

Modes

1. Quantitative
2. Kinetics
3. Standard Curve
4. Sample scan
5. Multi Wavelength test
6. DNA/Protein

Specifications

	LIUV-210	LIUV-210S	LIUV-310	LIUV-310S
Monochromator	Single-beam, grating system 1200 lines/mm		Dual-beam, single monochromator grating system 1200 lines/mm	
Wavelength Range	190-1100nm			
Wavelength Accuracy	±0.3nm			
Wavelength Repeatability	0.2nm			
Wavelength Resolution	0.1nm			
Photometric Range	0-125%T, -0.3-3.0A, 0-9999Conc.			
Photometric Accuracy	±0.3%T			
Photometric Repeatability	±0.3%T			
Stray Light	≤0.15%T@220nm&340nm			
Bandwidth	1.8nm	0.5, 1, 2, 4nm	1.8nm	0.5, 1, 2, 4nm
Stability	< 0.002A/h@500nm			
Baseline Straight	±0.004A			
Scanning Speed	Hi, Med., Low, Max. 800nm/min			
Data Output	USB standard interface			
Light Source	Tungsten Halogen/Deuterium Lamp			

FTIR-7600 FT-IR Spectrometer

FTIR-7600 is a single-beam FT-IR spectrometer. This instrument is operated by a PC with user friendly software and a comprehensive manual. Fast scan speeds, high accuracy and ease with operation are standard features. It is an indispensable analysis tool for various application fields such as chemistry, biology, pharmaceutical, materials, mineral, food and beverage, wine industry and quality control.

Specifications

Wavenumber Range	7800~375 cm^{-1}
Resolution	1 cm^{-1}
Signal Noise Ratio	20000:1 (resolution@4cm^{-1}; sample and background scan for 1 min@2100cm^{-1})
Detector	High performance DLATGS
Beamsplitter	Coated KBr
Light Source	Long life, steady state infrared emitter
Electronic System	A/D converter of 24 bits at 500MHz, USB 2.0
Power	110-220V AC, 50-60Hz
Dimensions	450mm x 350mm x 210mm
Weight	14 kg

Microplate Instruments

LIMR-200 Microplate Reader

LIMR-200 Microplate Reader is mainly used on clinical immunity-tests in the hospitals or epidemic prevention stations. It has good characteristics such as high sensitivity, high accuracy, fast checking, and ease for operation etc. The instrument has a dedicated keyboard that enables you to rapidly change functions and set parameters. Display is a LCD with alphanumeric and graphic options. Setting and detecting operations are easy and straightforward.

Features

- Detect absorbance and carry out detection based on quality and quantity respectively
- Automatically select filters for different items
- Conduct auto-check first when it starts up, and an initial setting and self-checking will begin.
- Save inspection commonly used programs in advance and display the program list on the LCD
- Has the ability to print results directly

Specifications

Measurement Range	0.0A ~ 3.0A
Absorbance Accuracy Error	0.1~1.0: ±1% or ±0.01Abs >1.0~2.0: ±2% or ±0.02Abs >2.0~3.0: ±10% or ±0.10Abs
Wavelength Range	400-700 nm
Filters	405nm, 450nm, 492nm, 630nm up to 7 filters
Accuracy of Filters	±3.0nm
Half-width of Filters	≤12nm
Repeatability	≤1.0%
Stability	≤±0.005A/10min
Linearity	0.1~1.0: ±1.25% >1.0~2.0: ±2% >2.0~3.0: ±8%
Reading Speed	<5secs/96holes (single wavelength) <7secs/96holes (double wavelength)
Measurement System	8-channel optical system with self calibration
Shaking	2 modes—user selectable
Data Link	RS-232
Display	240x128 pixels LCD screen
Output	Absorbance, qualitative judgment, value of P/CO, concentration, judgment of normal value and quality control value
Programs	30 programs can be stored
Dimensions and Weight	420 x 290 x 180 mm & 10 kg

LIWA-100 Microplate Washer

LIWA-100 Microplate Washer is an accessory for the LIMR-200 Microplate Reader. The function of the instrument is to wash enzymatic plates after detection with its main usage in medical departments or clinics. It also can wash or add reagent in other fields such as refined chemistry, medicine and biochemistry.

The instrument has a LCD, You can easily complete all your work by following the instrument's prompts. It is a highly automated instrument. It enables you to individually program and save preset programs in the memory.

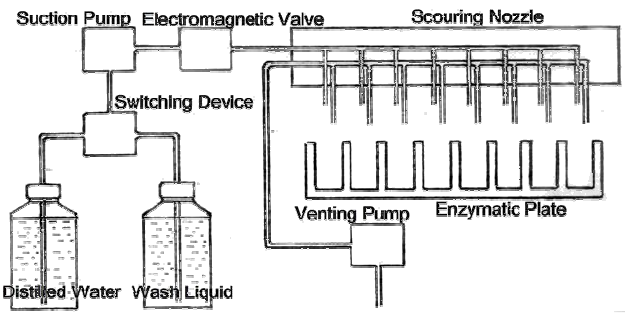
Features

- Automatic scouring of the instruments pipeline
- Various methods of cleaning to meet the requirement of different experiments
- Automatically flush the tube to avoid blockage resulted from lotion crystallization
- Simple interface for convenient operation
- Purpose: widely used in hospitals, blood stations, quarantine stations, reagent factories and laboratories.

Specifications

Washing Head	8 or 12 channels
Applicable Microplate	96 or 48 wells microplates
Washing Times Option	1~9
Washing Rows Option	1~12
Soak Time	1~3600s
Residual Volume	<3μl/well
Programs	up to 16 programs
Injection Error	<5%
Steeping	1 to 600 seconds
Dimensions	480mm×360mm×140mm
Weight	11Kg

Schematic



Spectroscopic Instruments

LIRA-300 Laser Raman Spectrometer

LIRA-300 Laser Raman Spectrometer is a useful instrument for the identification of a wide range of substances in physics and chemistry laboratories of scientific research institutes, universities and colleges. It is a straightforward, non-destructive technique requiring no sample preparation, and it involves illuminating a sample with monochromatic light and using a spectrometer to examine the light scattered by a sample.

Features

- Computer-controlled, user friendly interface, capable of automatic record of Raman spectra.
- Monochromatic system with high resolution and low stray light.
- Single-photon counter used as a receiver system, with high sensitivity and low noise.
- Diode-pumped solid state laser used as light source.
- External optic path system provided, with good stability and high accuracy.
- Various accessories available for analysis of liquid and solid samples .
- Trap filter available for cutting stray light.

Specifications

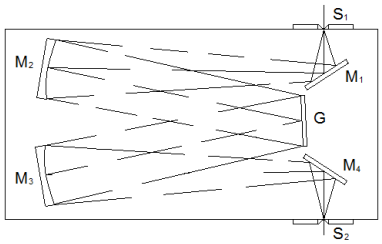
Monochromator	
Optical Grating	1200 lines/mm, blazed wavelength at 500 nm
Slit Width	0~2 mm, continuously adjustable
Notch Filter (optional)	532 nm
Single-photon Counter	
Integration Time	0~30 min
Max Count	10^{7}
Wavelength Range	200~800 nm
Wavelength Accuracy	≤0.4 nm
Wavelength Repeatability	≤0.2 nm
Stray Light	$\leq 10^{-3}$
Half-width of Spectral Line	≤0.2 nm at 586 nm

LEOI-94 Monochromator

LEOI-94 is manually operated monochromator that utilizes a dial for wavelength selection. Both the entrance and exit slits are straight with width continuously adjustable from 0 to 2mm with a reading resolution of 0.01mm. The beam passes through entrance slit S_1 (S_1 is on the focal plane of reflectance collimation mirror), then reflected by mirror M_2. The parallel light shoots to grating G. Mirror M_3 form the image of diffraction light comes from the grating on S_2.

Specifications

Wavelength Range	200-800 nm
Grating	1200 lines/mm
Relative Aperture	D/F = 1/7
Wavelength Repeatability	≤ 0.2 nm
Wavelength Accuracy	±0.4 nm
Slit width	0 ~ 2 mm adj., Resolution: 0.01mm
Focal Length	300 mm
Dimensions	370 x 250 x 210 mm



LEOI-100 Experimental CCD Spectrometer

LEOI-100 Experimental CCD Spectrometer is a general purpose and USB interfaced spectrum measuring instrument. It uses a linear CCD as a receiving unit capable of real-time acquisition and 3-dimensional display. It is ideal equipment for studying the spectra of various light sources or calibrating optical probes.

Experiment Examples

- CCD spectrometer calibration
- Observation of light source spectra, such as Sodium or Mercury lamp
- Measurement of Rydberg Constant

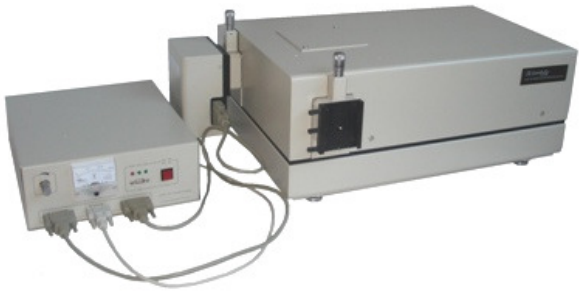
Specifications

Experimental CCD Spectrometer	
Wavelength Range	300 ~ 900 nm
Focal Length	302.5 mm
Relative Aperture	D/F=1/7
Resolution	≤ 0.2 nm
Wavelength Accuracy	≤ 0.4 nm
Wavelength Repeatability	≤ 0.2 nm
Stray Light	≤ 10^{-3}
Slit Width	0 to 2 mm, adjust., 0.01 mm
Grating	600l/mm, blazed at 550 nm
CCD Receiver	2048 cells Integration time: 1 ~ 88 stops
Yellow and White Filters	Yellow filter: 320 ~ 500 nm, White filter 500 ~ 900 nm

LEOI-101 Multifunctional Grating Spectrometer

The LEOI-101's modular structure makes experiments and tests much easier and are recommended to physics laboratories of institutions of higher learning. The system will measure Hydrogen-Deuterium and Sodium spectrum more accurately than conventional spectrometers.

Extensive experiments and test measurements have proved that the spectrometer has a high performance in a wide range of applications. It provides flexible solutions for optical measurements. Emission and absorption spectra can be measured. It is USB interfaced with friendly Windows application software



Experiment Examples

- CCD spectrometer calibration
- Observation of light source spectra, such as Sodium or Mercury lamp
- Measurement of Rydberg Constant

Specifications

Grating Monochromator	
Focal Length	500 mm
Wavelength Range	200~660 nm
Relative Aperture	D/F=1/7
Grating	2400 lines/mm; blazed wavelength at 250 nm
Stray Light	≤10^{-3}
Resolution	≤0.06 nm
Photomultiplier Tube	
Wavelength Range	200~660 nm
Wavelength Accuracy	± 0.2 nm
Repeatability of Wavelength	≤ 0.1 nm
CCD	
Receive Unit	2048 cells
Spectral Response Range	300~660 nm
Integrating Time	88 stops
Filter	White filter: 320~500 nm; yellow filter: 500~660 nm
Weight	25 kg

Thin Film Measurement

LIMF-10 Optical Thin-Film Measurement

Thin films are widely used in a variety of applications and the Thin-Film Measurement System can easily determine their properties. Based on interference spectral analysis of multi-reflection beams, this instrument functions non-contact optical measurement of thickness, refractive index and extinction coefficient of various thin films and coatings.

With dedicated hardware design and program development, this measurement system is easy to setup and the software is user friendly. It is suitable for both on-line manufacturing and desktop measuring.

Measurement Features

- Substrate refractive index and absorption index
- Film thickness, mean and standard deviation
- Film material refractive index and absorption index evaluation
- Data loading of previously saved reflectance data
- Statistics of measurement results
- Flexible choice of computation wavelength range (within the PC based spectrometer)
- Convenient selection from an included database with various film and substrate materials
- User defined materials selectable and user defined material data import/export

Specifications

Measurement Range	
Thickness only	20nm to 50µm
Thickness with n and k	100nm to 10µm
Wavelength Range	
Spectrometer	350nm to 1000nm
Light source	360nm to 2500nm
Accuracy	The greater of ± 1 nm or ± 0.5%
Precision	0.2nm
Repeatability	0.1nm
Spot size	Adjustable 0.8mm to 1cm (10µm with a microscope)
Sample size	From 1mm and up
Layers	Up to 4 layers
Detector type	2048-element linear silicon CCD array
Light source	Tungsten Halogen

Experimental Instruments

LEOI-20 Michelson Interferometer

The Michelson interferometer produces interference fringes by splitting a beam of monochromatic light so that one beam strikes a fixed mirror and the other a movable mirror. When the reflected beams are brought back together, an interference pattern results.

It can be used for observing interference fringes and precisely measure wavelengths, distance and index of refraction.

Experiment Examples

- Interference fringes of a He-Ne laser
- Equal inclination interference and equal thickness interference
- Wavelength measurement
- White light fringes (with optional item 6)
- Measurement of wavelength separation of Sodium doublet (with optional item 6)
- Measurement of the refractive index of air versus pressure (with optional item 7)

Specifications

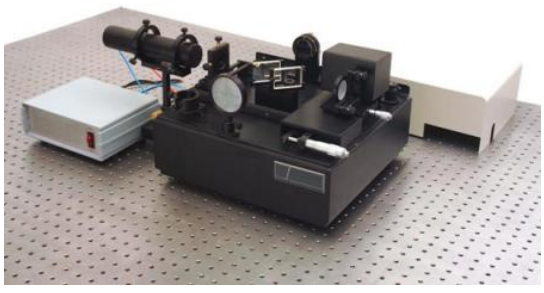
Interferometer main frame	
Flatness of Beam Splitter and Compensator	0.05λ
Travel of Movable Mirror	1.25mm (travel of micrometer: 25mm)
Minimum Travel Reading	0.0005mm
Wavelength Measurement Accuracy	Relative error of 2% for 100 fringes
Overall Dimensions	350×350×285mm
Weight of Main Frame	Approx. 17kg
He-Ne laser	0.7-1mW@632.8nm
Frosted glass screen	d = 60mm
Sodium-Tungsten lamp (Optional)	Sodium: 10W, Tungsten: 15W
Air Chamber with Gauge (Optional)	Chamber length of 80mm, gauge: 0 ~ 40Kpa

LEOI-21 Michelson and F-P Interferometer

This equipment combines the important Michelson interferometer and the high resolution Fabry-Perot interferometer in one rigid and compact structure.

Measurements are precise in two modes of operation. Switching between the two modes of operation and aligning components is relatively simple.

This instrument is suitable for physics teaching in universities and colleges.



Experiment Examples

Michelson Interferometer

- Interference fringes
- Equal inclination interference
- Equal thickness interference
- White light fringes
- Refractive index of air versus pressure

Fabry-Perot Interferometer

- Multiple beam Interference
- Sodium D-lines separation and measurement

Specifications

Interferometer main frame	
Flatness of Beam Splitter and Compensator	0.05λ
Travel of Movable Mirror	1.25mm (travel of micrometer: 25mm) 10mm for presetting (coarse micrometer)
Minimum Travel Reading	0.0005mm
Wavelength Measurement Accuracy	Relative error of 2% for 100 fringes
Overall Dimensions	350×350×245mm
Weight of Main Frame	Approx. 17kg
He-Ne laser	0.7-1mW@632.8nm
Laser holder	
Frosted glass screen	d = 60mm
Sodium-Tungsten lamp	Sodium: 10W, Tungsten: 15W
Air Chamber with Gauge	Chamber length of 80mm, gauge: 0 ~ 40Kpa
Small Telescope (optional)	6×, with holder

LEOI-22 Precision Interferometer

This equipment combines the Michelson interferometer, the high resolution Fabry -Perot interferometer and the useful Twyman-Green interferometer.
Measurements are precise in three classical modes of operation. Switching between the three modes of operation and aligning components are very simple, as this complete set of high quality components is carefully mounted on a heavy, stable base.

Experiment Examples

Michelson Interferometer

- Interference fringes observation
- Equal thickness interference
- Determination of wavelength
- Refractive index of transparency slice
- Equal inclination interference
- White light interference
- Precise comparing of wavelengths
- Refractive index of air

Fabry-Perot Interferometer

- Multiple beam Interference
- Measurement of the Wavelength Separation of Sodium D-lines
- Measurement of λ of He-Ne Laser

Twyman-Green interferometer

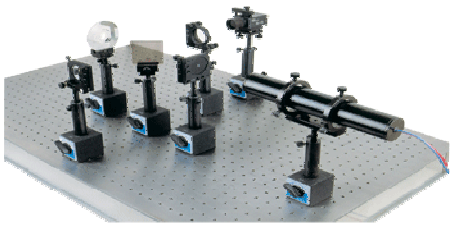
- Demonstration of Twyman-Green interferometer

Specifications

Interferometer main frame	
Flatness of Beam Splitter & Compensator	Better than 1/10 λ
Min Division Value of Micrometer	0.01mm, corresponds to a movement of 0.00025mm of movable mirror
Travel of Micrometer	25mm for fine micrometer 10mm for presetting (coarse micrometer)
Travel of Movable Mirror	0.625mm
Fabry-Perot Mirror	30 mm, 95% T
Wavelength Measurement Accuracy	Relative error of 2% for 100 fringes
He-Ne laser	0.7-1mW@632.8nm
Laser holder	
Frosted glass screen	d = 60mm
Sodium-Tungsten lamp	Sodium: 10W, Tungsten: 15W
Air Chamber with Gauge	Chamber length = 80mm, gauge: 0 ~ 40Kpa
Transparency Slice Clip	2 Samples

LEOI-26 ESPI Experimental System

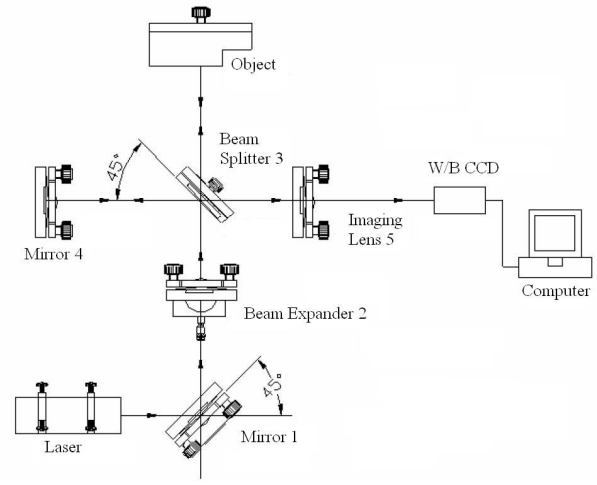
Electric speckle interference experimental system (**ESPI**) makes use of speckle, which is the carrier of rough surface information, to study a substance. It is a modern optical measuring technique that covers the fields of image processing techniques, laser technology and holographic interference techniques.



Due to the coherence of the laser, the speckle is so obvious that can be easily and clearly shot by a CCD camera and the data as well as an image attained can be processed by a computer.

Experiment Examples

- Measurement of a heated aluminium block
- Measurement of a deformed metal plate



Specifications

He-Ne Laser with Power Supply	1.5 mW@632.8nm
Measurement Error	1/2 λ @ 632.8nm
Beam Expander	f = 4.5mm
Beam Splitter	6:4, 60x50x6.3 mm
Lens	f = 70mm
B/W CCD with Power Supply	752 (H) x 582 (V) pixels
Image Card	640 x 480 x 16 bit

LEOI-30 Diffraction Intensity System

The Diffraction Intensity System enables you to quantitatively investigate diffraction effects.
To capture and analyze the diffraction patterns, we use a photocell to transform the diffraction pattern into a current and then read from a LED display. As it is designed for students to improve and consolidate their understanding on intensity distribution of diffraction, this system allows students to draw curves of the diffraction pattern with numerical data recorded.

Experiment Examples

Near-field diffraction—Fresnel

- At a single slit
- At a circular aperture
- At a straight edge

Far-field Diffraction—Fraunhofer

- At a single slit
- At a double slit
- At a multi-slit
- At a single circular aperture

Specifications

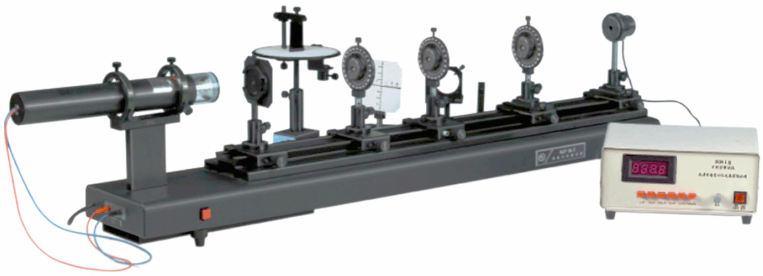
Optical rail and base	1 m long, black anodized aluminum with power supply
He-Ne Laser	1.5mW@632.8nm
Multi-hole plate	8 holes, 0.1, 0.15, 0.2, 0.3, 0.5, 0.7, 1, 2 mm in dia
Displacement Range of Photocell	90mm
Displacement resolution	0.01mm
Receiving Unit	20μW ~ 200mW, 6 stops, with detector head
Width of Adjustable slit	0 ~ 2mm
Lens	f = 6.2, 150mm
Multi-slit plate	2, 3, 4, 5 slits
Transmission grating	20l/mm (with mount)

LEOI-40 Experimental System for Polarized Light

LEOI-40 system has been developed to help students grasp the concept and mechanism of polarization. It allows the student to measure different types of polarization and the working parameters of the optical elements involved. The system is also designed to be operated manually and can improve students' hands-on ability and consolidate the knowledge and skills they have learned. Experiment results collected can be graphed to schematically illustrate the theory of polarization.

Experiment Examples

- Polarized reflection
- Measurement of Brewster angle
- Verification of Malus' law



Specifications

Optical rail and base	1m long, black anodized aluminum with power supply
He-Ne laser With Brewster window	
Wavelength and power	1.5mW@632.8nm
Polarization Ration	Linear
Power Stability	5%
Tube Working Voltage	1200V
Divergence	〈1.3mrad
Single-sided slit	Slit width: 0 to 5mm, slit tilt-able: ±5°
Polaroid	Φ20mm with holder
1/2 Wave plate	Φ10, λ=632.8nm, quartz
1/4 Wave plate	Φ10, λ=632.8nm, quartz
Lens	*f* = 150mm
Black glass	50×27 mm
Beam splitter	*f* = 4.5mm
Small light source	High brightness LED
Photocurrent amplifier	Gain adjustable

LEOI-50 DPSS Laser Demonstrator

LEOI-50 is designed for nonlinear optical experiments for laser education at universities/colleges. It can help students to understand the theory of diode pumped solid state lasers (DPSS) and frequency doubling. A solid state laser pumped by a semiconductor laser at 808nm, emits infrared light at 1.064μm.

By putting a KTP crystal into the cavity you can generate frequency-doubled green light. During the experiment, a lot of light path adjustment is involved, allowing students to be more practically familiar with the principle.

Specifications

Optical Rail with Base	1.1m long, black anodized aluminum with power supply
Semiconductor Laser	808nm, ≤ 500mW
Laser Driver Current Control	Output: 0 ~ 500mA
He-Ne Laser	1.5 mW@632.8 nm
KTP Crystal	2 × 2 × 5mm
Nd: YVO_4 Crystal	3 × 3 × 1mm
Output Mirror	Dia: 6mm, R = 50mm
Optical Filter	10 mm aperture
Laser Power Indicator	2μW ~ 200mW, 6 stops
IR Viewing Card	750 ~1600 nm
Maximum Green Laser Output	<40mW@532nm

Key Features

- 532 nm laser output power between 10 ~ 40mW
- Variable pumping current
- Understand the theory through practice

LEOI-51 He-Ne Laser Mode Analyzer

LEOI-51 He-Ne Laser Mode Analyzer allows users to quantitatively assess the mode characteristics of a He-Ne laser. Users may perform laser mode analysis on a computer and may also observe mode spectrum with an oscilloscope. Theoretical and practical descriptions supplied with the device will assist you.

Experimental Examples

- Familiar with principle and operation of con-focal spherical scanning interferometer
- Observation of longitudinal and transverse modes distribution.
- Observation of several of modes of different lasers
- Determination of mode structure by calculating modes spacing of the laser

Specifications

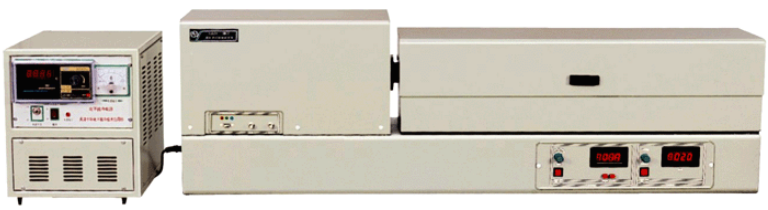
Optical Rail and Base	He-Ne Laser Power Supply and Sawtooth Signal Generator are built inside the base
He-Ne Laser	1.5mW@632.8 nm
Cavity Length	246 mm
Center Wavelength	632.8 nm
Confocal Scanning Interferometer	
Cavity Length	20 mm
Curvature of Concave Mirror	20 mm
Reflectivity of Concave Mirror	99%
Finesse	〉200
Free Spectral Range (FSR)	4 GHz
Mode Spacing Error	〈 20 MHz
High Speed Receiver	

LEOI-61 Single-Photon Counting Experiment System

Based on a reliable PMT sensitivity in the visible spectral range, this photon counting system is able to detect weak optical signals down to the single photon level. It is important in many quantum information processing applications. Photon counter functions by absorbing photons from the field, converting single photons into electronic information (many thousands of electrons) with high quantum efficiency.

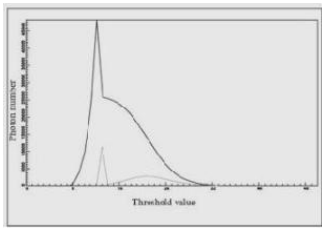
Experimental Examples

- Determining the detection sensitivity
- Measuring the photon counting ratio
- Determining the receiving light power
- Measuring the relationship between the operating temperature and the dark-counting ratio



Specifications

Detector	CR125 Photomultiplier tube
Wavelength Range	360-650 nm
Wavelength Repeatability	≤0.2nm
Integration Time	0-30 min (1ms/stop, adjustable)
Threshold Voltage	0-2.56V (10 mV/stop, adjustable)
Max Count Reading	more than 10^7
Dark Count	less than 30cps (-20℃)
Relative Aperture	Continuously adjustable from 0 to 2mm
Stray Light	≤10^{-3}
Resolution	± 0.4nm
Semiconductor refrigeration system	≥-20º C



LEOI-200 Fourier Transform Visible Spectrometer

LEOI-200 Fourier Transform Spectrometer is designed to demonstrate the measurement of the spectrum of the light sources by means of Fourier Transform. It adopts an open structure of the optical path and measurement in visible spectrum (400 to 800 nm), which makes it ideal for demonstration of a Fourier Transform.

Experiment Examples

- Observation of light source spectra, such as Sodium or Mercury lamp
- Retrieve Interferograms
- Many functions attached with the software

Specifications

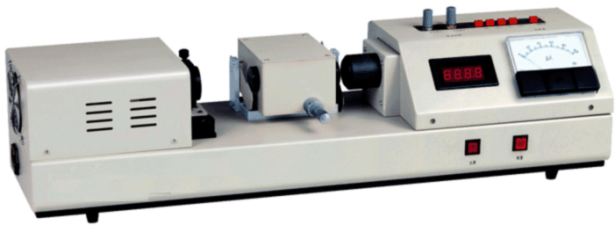
Wavelength Range	400 to 800nm
Wavelength Resolution	1nm
Wavelength Accuracy	1nm
Beam Expander	f = 4.5 mm
Windows Software and User Manual	

LEDI-1 Experimental Unit of Planck's Constant

The measurement of Planck's constant has being carried out in many educational institutions with a variety of approaches.

This experimental unit uses the photoelectric effect, where electrons stimulated by incoming light, create an electric current to experimentally determine the value of Planck's constant (h).

This unit also encourages students to get a fundamental understanding of the quantum character of light and to gain experience with experimental skill related to photoelectric effect.

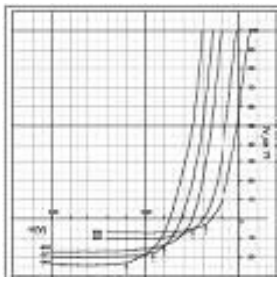


Experiment Examples

- Comparison of light's wave model and quantum model
- Measurement of Planck Constant

Specifications

Experimental Unit	
Fan	0.17A for abstraction of heat
Condenser	f' = 50mm, f' = 70mm
Tungsten-Bromine lamp	12V, 75W
Monochromator	Grating type
Wavelength range	200-800nm C12V
Slit width	0-3mm
Wavelength accuracy	±3nm
Wavelength repeatability	±1nm
Photoelectric tube	GD31A type
DC regulated power supply	±1.8V
Measuring Amplifier	4 stop, 100μA, magnetoelectric



Approximate I-V curve indicating the photoelectric cell's volt-ampere characteristic

LEMI-1 CCD Young's Modulus Measuring Instrument

Young's Modulus, *E*, is a constant that describes the material's mechanical property of stiffness and is expressed as the ratio of stress to strain for a material experiencing tensile or compressive stress.
We designed this apparatus to demonstrate that the deformation is proportional to the strain for a metal wire under load which is parallel to the axis of the wire and is applied to one end while the opposite end is held fixed. A microscope and CCD image-forming system is equipped.

Experiment Example

- Measurement of Young's Modulus

Specifications

Experimental Unit	
Stainless Steel Wire	50 cm long, 0.20 mm in diameter
Molybdenum Wire	50 cm long, 0.1 mm and 0.18 mm in diameter
Upright Column	About 60 cm in height
Operating Temperature	-5°~ 40°
Ambient Humidity	10 ~ 80 %
Relative Uncertainty of Measurement	<5%
Weights	100g, 200g
Microscope	Measuring range: 3 mm, minimum
CCD camera	Black and White, Effective pixel: 752(H) ×582(V), Camera lens: *f* =16mm
Video Monitor	Black and White, 14 inch, Impedance: 75 Ω

LETI-1 Thermal Expansion Experiment Unit

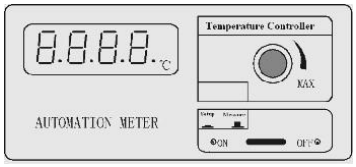
This unit utilizes a Michelson interferometer to determine the linear expansion coefficient of the sample materials very accurately.

With an oven for the thermal expansion and a mirror attached to the sample acting as a movable mirror in a Michelson interferometer, this specially design unit makes use of the interference pattern to determine the linear expansion by counting fringes.

Experiment Examples

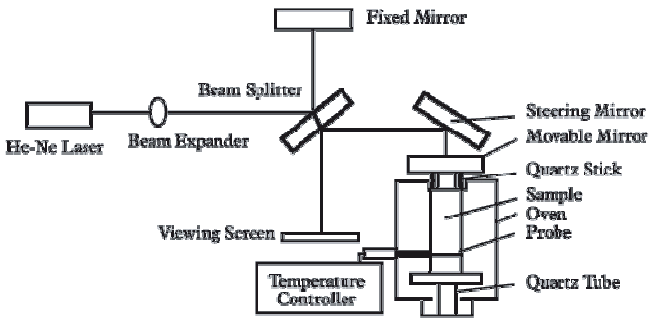
Measurement of Linear Thermal Expansion Coefficient by:

- Preset Temperature
- Preset Length



Specifications

Thermal Expansion Experiment Unit	
Heating Range	18~ 60℃, temperature controlled
Temp. Measuring Accuracy	0.1 ℃
Power Consumption	50 W
Error of Linear Expansion Coefficient	< 3%
He-Ne Laser	1 mw@632.8nm
Plane Mirror	with quartz tube and connector
Lift Tool	with M4 screw
Aluminum Alloy Sample	*L* =150mm
Copper Alloy Sample	*L* =150mm
Steel Sample	*L* =150mm

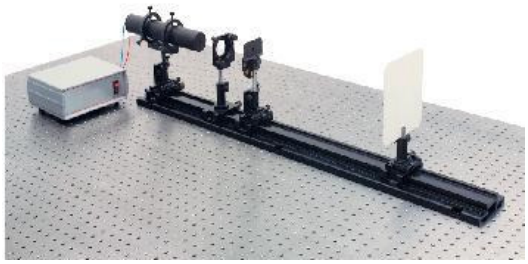


Schematic diagram

Education Kits

LEOK-1 Optics Experiment Kit

The LEOK-1 Optics Experiment Kit is developed for general physics education in universities and colleges. It can be used to construct eight experiments, covering the basic experiments in geometrical optics, physical optics and information optics. LEOK-1 can also be upgraded to include extra experiments by adding the corresponding parts from LEOK-3.

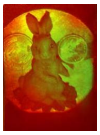


Experiment Examples

1. Measuring Focal Length Using Autocollimation
2. Measuring Focal Length Using Displacement Method
3. Assembling a Slide Projector
4. Young's Double-Slit Interference
5. Fresnel Diffraction of Single Slit
6. Fresnel Diffraction of Single Circular Aperture
7. Abbe Imaging Principle and Optical Spatial Filtering
8. Pseudo-color Encoding, Theta Modulation and Color Composition

LEOK-2 Holography & Interferometry Kit

The LEOK-2 Holography and Interferometer Kit is developed for general physics education in universities and colleges. It provides a complete set of optical and mechanical components as well as light sources. Through selecting and assembling corresponding components into complete setups, students experimental skills and problem solving ability can be greatly enhanced.

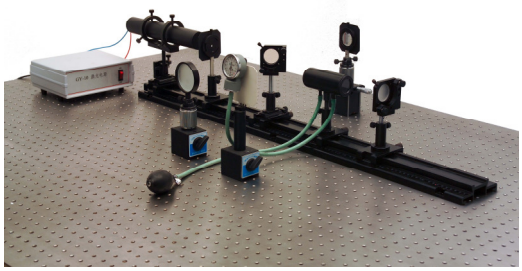


Experiment Examples

1. Recording and reconstruction of holograms
2. Making holographic grating
3. Constructing a Michelson interferometer
4. Constructing Sagnac interferometer
5. Constructing Mach-Zender interferometer

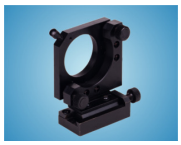
LEOK-3 Optics Experiment Kit

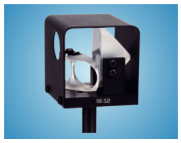
The LEOK-3 Optics Experiment Kit is developed for general physics education in universities and colleges. It provides a complete set of optical and mechanical components as well as light sources. Almost all optics experiments required in general physics education (e.g. geometrical, physical, and modern optics) can be constructed in sequence using these components. Through selecting and assembling corresponding components into the complete setups, students experimental skills and problem solving ability can be greatly enhanced.



Experiment Examples

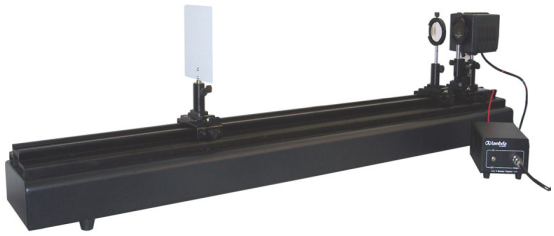
1. Measuring the focal length of a positive thin lens using auto-collimation
2. Measuring the focal length of a positive thin lens using displacement method
3. Measuring the focal length of an eyepiece
4. Assembling a microscope
5. Assembling a telescope
6. Assembling a slide projector
7. Measuring the nodal locations and focal length of a lens-group
8. Assembling an erect imaging telescope
9. Young's double-slit interference
10. Interference of Fresnel's biprism
11. Interference of double mirrors
12. Interference of Lloyd's mirror
13. Interference of Newton Ring
14. Fraunhofer diffraction of a single silt
15. Fraunhofer diffraction of a single circular aperture
16. Fresnel diffraction of single silt
17. Fresnel diffraction of single circular aperture
18. Fresnel diffraction of a sharp edge
19. Analysing polarization status of light beams
20. Diffraction of a grating
21. Assembling a Littrow-type grating spectrometer
22. Recording and reconstructing holograms.
23. Making holographic gratings.
24. Abbe imaging principle and optical spatial filtering.
25. Pseudo-colour encoding, theta modulation and colour composition.
26. Assembling a Michelson interferometer and measuring air refractive index





LEOK-4 Geometrical Optics Experiment Kit

This kit provides complete set of optical and mechanical components as well as light sources, which can be conveniently assembled to construct experimental setup of geometrical optics. Through selecting and assembling the corresponding components into the setups by students themselves, their experimental skills and problem solving ability can be greatly enhanced.



Experiment Examples

1. Measuring focal length of a positive thin lens by measuring object length and image length
2. Measuring the Focal Length of a Positive Thin Lens Using Auto-collimation
3. Measuring the Focal Length of a Positive Lens Using Displacement Method
4. Measuring the Focal Length of a Concave Lens
5. Measuring Focal Length of an Eyepiece
6. Measuring the Nodal Locations and Focal Lengths of a Lens-Group
7. Assembling a Microscope
8. Assembling a Telescope
9. Assembling a Slide Projector

LEOK-5 Lens Aberration and Fourier Optics Kit

There six basic optical aberrations affecting the ideal performance in an optical system, which are chromatic aberration, spherical aberration, coma, distortion, curvature of field and astigmatism. Optical lens can perform the Fourier transform to light field on object plane. Students will be enhanced their knowledge of Fourier optics, spatial filtering and aberrations through the proposed experiments.

Experiment Examples

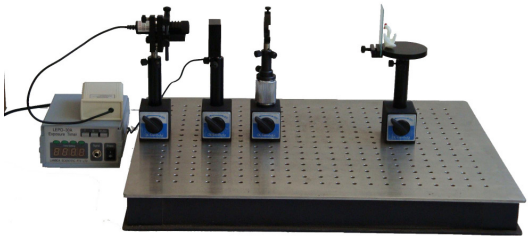
Lens Aberrations

1. Spherical aberration
2. Field Curvature
3. Astigmatism
4. Coma
5. Image distortion
6. Chromatic aberration

Fourier Optics and spatial filtering

1. Include low-pass filtering high-pass filtering and directional filtering

LEOK-10 Room Light Holography Kit



LEOK-10 Holography Kit is designed for basic education of holography in institutions of higher learning. While ideal for demonstrating in a classroom and physics lab, this kit is also suitable for amateurs who are fascinated with the startling real 3D effect that holograms produce.

This holography kit gives you all the essentials to make white light holograms with ease. Every user can record rainbow holograms *under ordinary light*.

Experiment Examples

1. Recording Reflection Holograms
2. Recording Transmission Holograms
3. Reconstruction of Holograms

Key Features

This cost effective kit provides you with the equipment required to make white light holograms with easy operation. A detailed practical procedure manual is supplied with this kit, allowing holography now accessible to everyone and easy to use.

Specifications

Semiconductor Laser	35mW@650 nm, bandwidth: 0.2nm
Photopolymer Plate	Resolution: 4000 l/mm, sheet: 90X240mm
Exposure Timer and Shutter	0.1-999.9 s, LED, manual & remote control
Optical Table	600X600X60mm

A semiconductor diode laser, 35mW at 650nm, can greatly reduce exposure time, which decreases the influence of vibration on holographic recording.

The digital electronic timer with a shutter employs IC technology in the timing electronics which ensures highly stable, accurate and reliable results.

LEOK-20 Fiber Optics and Communication Experiment Kit

We designed this kit to satisfy the increasing demand from the support of laboratory based experiments. This kit will provide you essential basic knowledge and skills. Upon acquiring the laboratory techniques, which can be used for characterization of important fiber parameters through practical hands on experience, students may better appreciate the fascinating characteristics of fiber optics.

Experiments Examples (7)

1) Experiment of fundamental knowledge of optical fiber optics
2) Experiment of coupling method between optical fiber and light source
3) Multimode fiber Numerical Aperture (NA) measurement
4) Optical fiber transmission loss property and measurement
5) M-Z optical fiber interference experiment
6) Optical fiber thermal sensing principle
7) Optical fiber pressure sensing principle

LEOK-21 Fiber Optics and Communication Experiment Kit

This Fiber Optic Experimental kit is a sister kit to LEOK-20, which has been revised and rewritten to include some new experiment. If you are looking for something more advanced, to continuously extend your learning in fiber optics, this kit supplies more equipments and offer more experiment required to measure parameters of optical fiber beam splitter, attenuator and isolator.

Experiment Examples (10)

Experiments 1) - 7) of LEOK-20 Plus:

8) Optical fiber beam splitter parameter measurement
9) Adjustable optical attenuator and parameter measurement
10) Fiber optic isolator and parameter measurement

LEOK-22 Fiber Optics and Communication Experiment Kit

This kit will provide an overview of fiber optic technology and basic skills needed to work with fiber optics. It is made up of 15 laboratory experiments. The most commonly used optical elements and their parameter measurements are introduced in this kit, together with prime techniques, such as WDM and coupling. Student may master characteristics of isolator, attenuator, optical switch, transmitter, amplifier etc.

Features

- 15 basic experiments required for students with major in optoelectronics and optical communication
- Enables students to characterize major components of optical fiber communication systems
- Allows students to investigate the prime issues of attenuation and dispersion
- Determine what factors influence performance of optical fiber communications system
- Quick installation, includes necessary optical elements and optoelectronic instrumentation
- Time saving and no preparation for the tutor, extensive literature support provided
- Competitive price with innovative design
- Suitable for different student levels
- Straightforward to reconfigure for open ended projects

Experiments Examples (15)

Experiments 1) - 10) of LEOK-21 Plus:

11) Fiber optic optical switch experiment

12) Wavelength division multiplexing (WDM) principle

13) Optical transmitter's extinction ratio measurement

14) Erbium-doped optical fiber amplifier principle

15) Open circuit audio analog signal transmission experiment

LEOK-30 Newton's Ring Apparatus

The phenomenon of Newton's rings, named after Isaac Newton, is an interference pattern caused by the reflection of light between two surfaces - a spherical surface and an adjacent flat surface. When viewed with monochromatic light it appears as a series of concentric, alternating light and dark rings centered at the point of contact between the two surfaces.
Using this apparatus, observation of equal thickness interference and calculation of surface curvature by measuring interference fringe separations of Newton Ring can be performed.

Experiment Examples

- Observation of equal thickness interference
- Calculation of surface curvature

Specifications

Sodium Lamp with Power Supply	15 ± 5 V AC, 20W
Reading Microscope	
Min Division of drum	0.01mm
Magnification	20x, (1x, f = 38mm for Objectives, 20x, f =16.6mm for eyepiece)
Working distance	76 mm
View field	10 mm
Measurement Range of reticule	8 mm
Measurement Accuracy	0.01mm
Radius of Curvature of Newton's Ring	868.5mm
Beam Splitter	5:5

Light Sources

LLC-1 Tungsten-Bromine Lamp

The LLC-1 is a compact instrument which produces strong light energy, making it an ideal visible and near IR light source. It can be used to analyse absorption and fluorescence spectra of a sample.

Lamp power: 30W/12V

LLC-2 Deuterium and Tungsten-Bromine Lamp

The LLC-2 uses a special power supply to ensure steady and consistent lamp output and has excellent focusing power. It is an ideal ultraviolet-visible light source and can be used to analyse absorption and fluorescence spectra of a sample.

LLC-3 Adjustable White Light Source

Compact and robust. It can be used in the laboratory as an adjustable incandescence light source In addition, diffused reflected light can be generated through a frosted glass.

Lamp power: 30W/12V

LLC-4 White Light Source

The LLC-4 can be used as an incandescence light source in the laboratory.

Lamp power: 15W/6V

LLC-5 Dual Purpose Tungsten Lamp

The light of LLC-5 Tungsten-Bromine lamp passes through the optical system, and forms an approximate parallel beam. Various apertures and slits can be placed in the lamp housing. A planar light source is generated through spherical ground glass at the side of the lamp box and the output power can be adjusted continuously.

Lamp power: 30W/12V

LLC-6 Small Illuminating Lamp

The LLC-6 is a very useful small illuminating lamp for laboratory use.

Lamp power: 3VDC

LLC-7 High Pressure Spherical Xenon Lamp (150W)
LLC-7-75 (75W)

The LLC-7 is a gas discharge light source. The lamp, filled with high pressure xenon gas, can be excited by high frequency and high voltage and will produce strong and continuous spectra from ultraviolet into the visible range. It is air-cooled by a fan.

LLC-8 IR Light Source (porcelain clay rod)

The LLC-8 light source is specifically designed to be used in the in 4000-400cm^{-1} range. It is powered by a special power supply, and equipped with light focusing and modulation capabilities. It can be used grating spectrometer for measuring infrared absorption spectrum.

LLE-1 Low-pressure Mercury Lamp

The LLE-1 can be used as a standard light source to verify and adjust the wavelength precision and resolution of many instruments.

:Lamp power: 20W

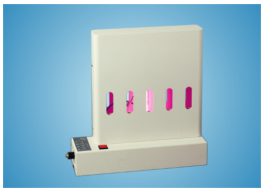
LLE-2 Sodium Light Lamp

The LLE-2 Sodium double lines emitted can be used for wavelength calibration and resolution adjustment. . It can also be used to study the sodium spectrum.

Lamp power: 20W

LLE-3 Multi-group Discharge Lamp

The LLE-3 is a multi-group discharge light source consists of He, Ne, H, and N and designed to be used in teaching and research laboratories. The lamps wavelengths can be used for calibration purposes.



LLE-4 Hydrogen Lamp

The LLE-4 lamp generates the spectral lines of Hydrogen, 410.18nm, 434.05nm, 486.13nm and 656.28nm. It can be used to calibrate wavelength. It is widely used in physics lab at university or colleges, and is an essential experimental and teaching light source.

LLE-5 Hydrogen Lamp

The LLE-5 lamp generates the spectral lines of Hydrogen, 410.18nm, 434.05nm, 486.13nm and 656.28nm. It can be used to calibrate wavelength. As compared to the LLE-4 this model is designed with a stand for adjusting the height.

LLE-6 High Pressure Spherical Mercury Lamp

The LLE-6 is a small volume and high brightness point light source, and it will produce a strong ultraviolet-visible spectrum. The main spectral lines are 313.2nm, 334.1nm, 365nm, 366,3nm, 404.7nm, 435.8 and 456.1nm

Lamp power: 200W

LLE-8 Hydrogen-Deuterium Lamp

The LLE-8 is gas discharge light source and has many applications in the physics laboratories, such as calibration etc. The main spectral lines are:
Hydrogen: 410.18nm, 434.05nm, 486.13nm and 656.28nm
Deuterium: 410.07nm, 433.93nm, 486.01nm, 656.11nm

LLE-9 High Pressure Mercury Lamp

The LLE-9 is a powerful arc-discharge mercury lamp. The high in-tube gas pressure and luminescent efficiency means, more and stronger mercury spectral lines can be obtained.

Lamp power: 50W

LLL-1 Semi-conducting Laser

The LLL-1 is used in geometric optics, interference, diffraction and polarization experiments. Laser wavelength: 650nm

Output power: 3 ~ 40mW selectable

LLL-2 He-Ne Laser

The LLL-2 is a single wavelength light source, and can be used in numerous experiments including geometric optics, interference, diffraction, polarization, etc.

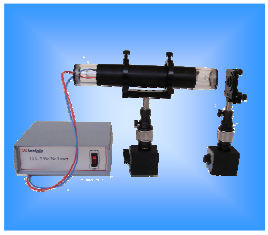
Wavelength is 623.8nm,
Output power option 1; 0.8mW, cavity length of 175mm
Output power option 2: 1.5mW, cavity length of 250mm

LLL-3 Green Laser

The LLL-3 is a semi-conducting laser. The 532nm output wavelength is obtained through frequency doubling.

Output power: ≥40mW. CW

LLL-4 Open Cavity Polarised He-Ne Laser



The LLL-4 Polarized He-Ne Laser is an open cavity He-Ne laser with a Brewster window at one end for polarisation.
Output power: ≤1.5mW

Lambda Scientific Pty Ltd

6A HENDER AVE, PO BOX 284, MAGILL, SA 5072, AUSTRALIA
Tel.: +61 8 8333 0382
sales@lambdasci.com
www.lambdasci.com